US007343891B1

(12) **United States Patent**
Chang

(10) **Patent No.: US 7,343,891 B1**
(45) **Date of Patent: Mar. 18, 2008**

(54) **STARTING DEVICE FOR A MODEL ENGINE**

(75) Inventor: **Lien Sheng Chang**, Taichung Shien (TW)

(73) Assignee: **Golden Lion Enterprise Co., Ltd.**, Taichung Shien (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/509,823**

(22) Filed: **Aug. 25, 2006**

(51) **Int. Cl.**
F02N 3/02 (2006.01)

(52) **U.S. Cl.** **123/185.3**

(58) **Field of Classification Search** ..... 123/179.1, 123/179.24, 179.25, 185.1, 185.2, 185.3, 123/185.6; 74/6, 7 C, 8; 185/39, 40 R, 185/41 A
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,765,438 A * 6/1998 Chang 74/6
6,994,066 B2 * 2/2006 Liu 123/185.3
6,997,155 B1 * 2/2006 Lu 123/179.25
2002/0139341 A1 * 10/2002 Tsuno 123/185.3
2003/0037750 A1 * 2/2003 Ueda et al. 123/185.14
2003/0079558 A1 * 5/2003 Muehlbauer 74/6
2004/0134293 A1 * 7/2004 Lai 74/6
2005/0268876 A1 * 12/2005 Liu 123/185.3

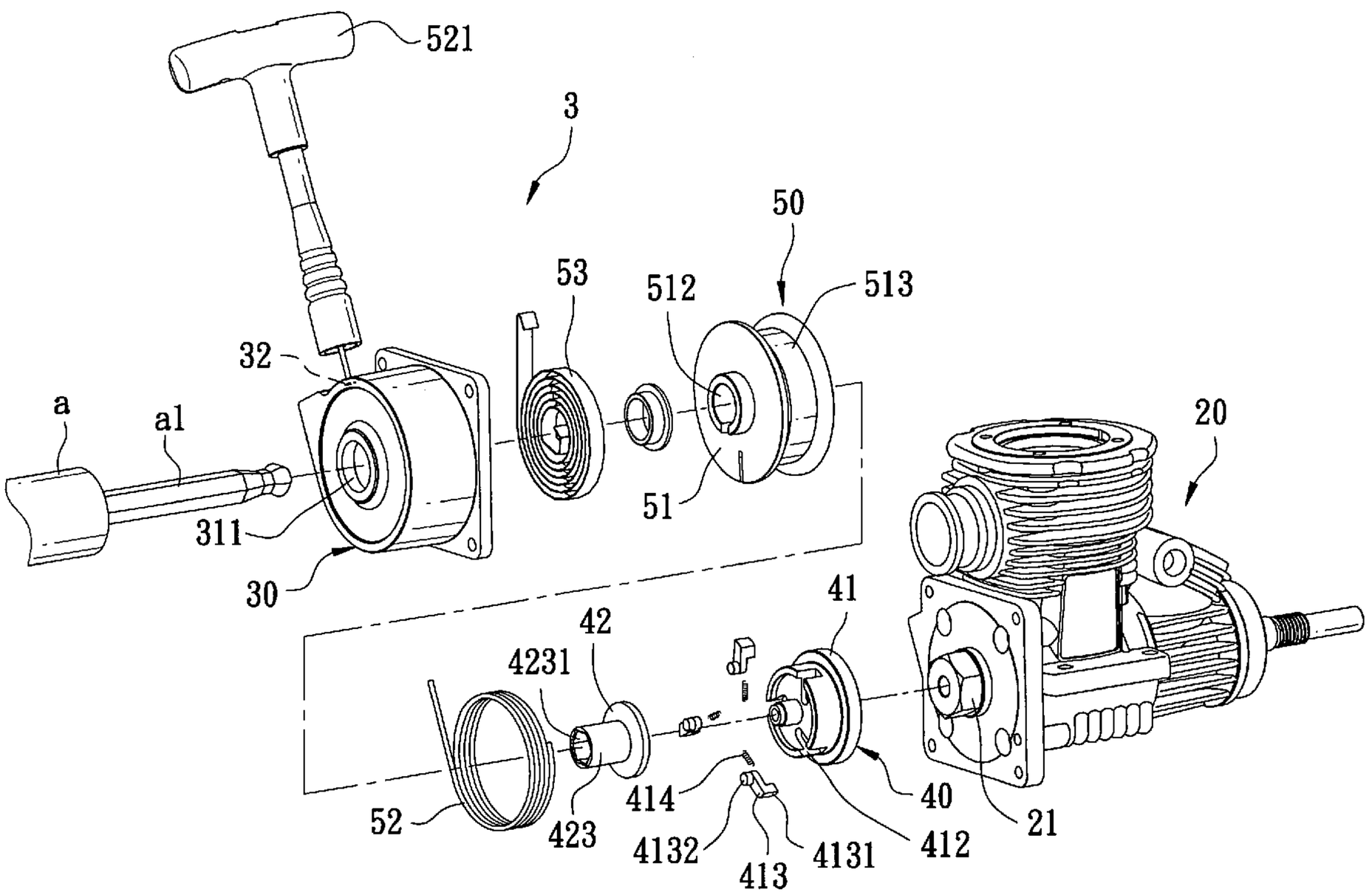
* cited by examiner

Primary Examiner—Stephen K. Cronin
Assistant Examiner—Ka Chun Leung
(74) *Attorney, Agent, or Firm*—Ming Chow; Sinorica, LLC

(57) **ABSTRACT**

A starting device for a model engine includes an electric-operation unit and a rope-operation unit. The electric-operation unit consists of an engage wheel having engage teeth elastically engaged thereon, and a starting shaft slidably fitted at the outer side of the engage wheel. The starting shaft has its inner side bored with a fitting slot having its circumference eccentrically cut with plural arc-shaped grooves matching with the engage teeth of the engage wheel. The arc-shaped grooves of the starting shaft can eccentrically actuate the engage teeth to move back and forth axially on the engage wheel. The rope wheel of the rope-operation unit is fitted on the starting shaft, having its inner side equidistantly and annularly bored with plural tooth grooves elastically engaged by the engage teeth. By changing the positions of the engage teeth, the starting device can be started in two different modes.

5 Claims, 8 Drawing Sheets



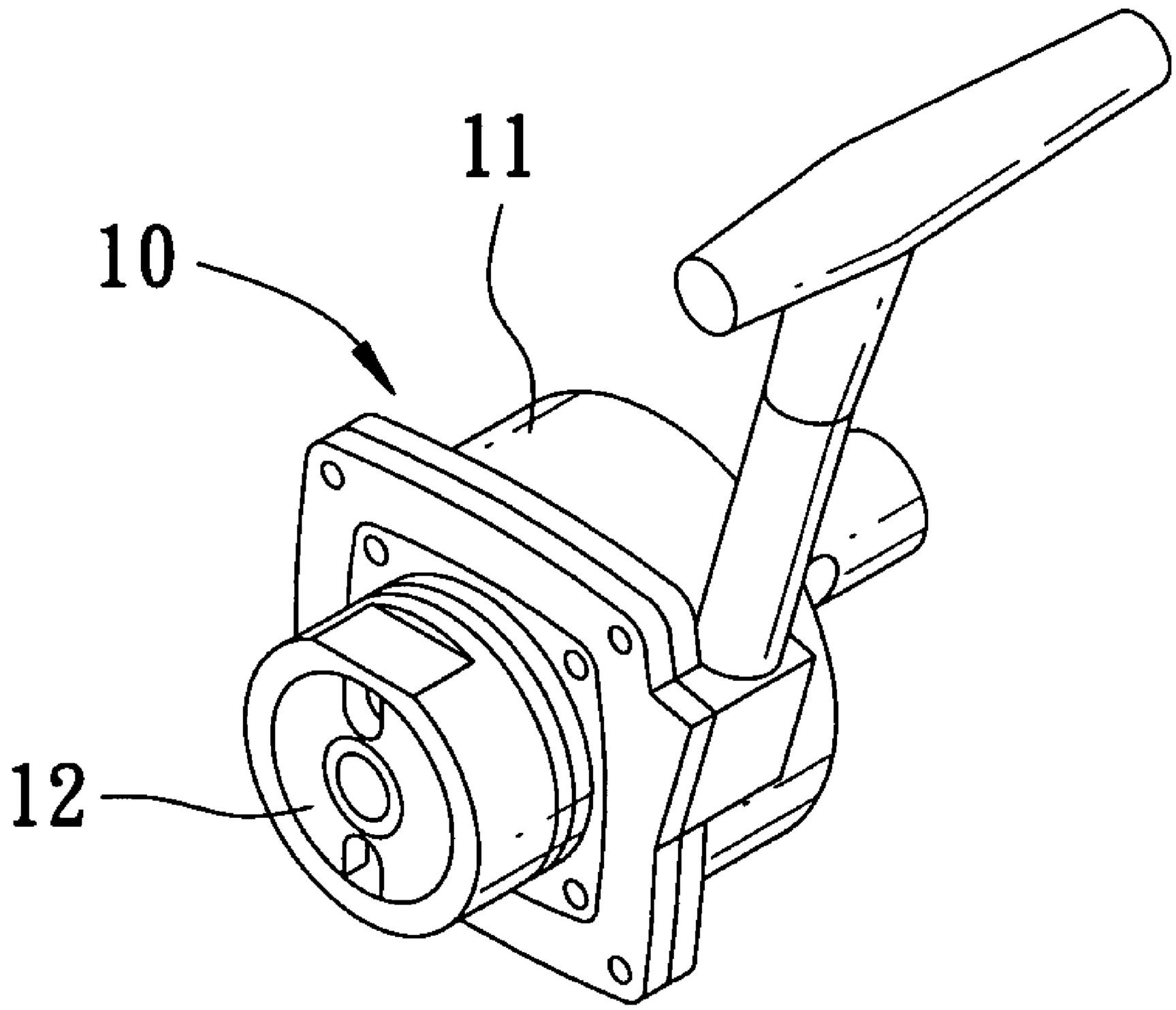


FIG. 1
PRIOR ART

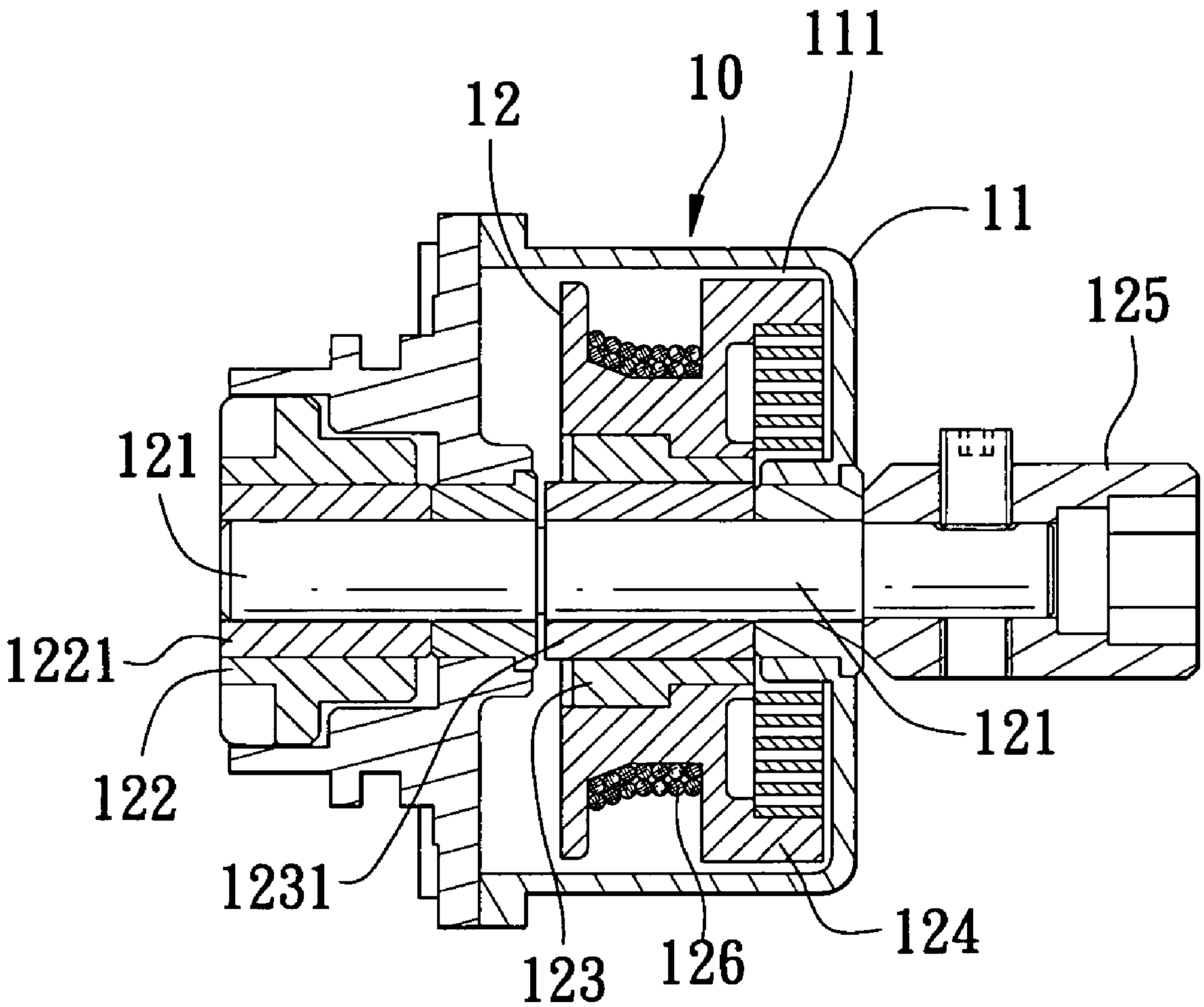


FIG. 2
PRIOR ART

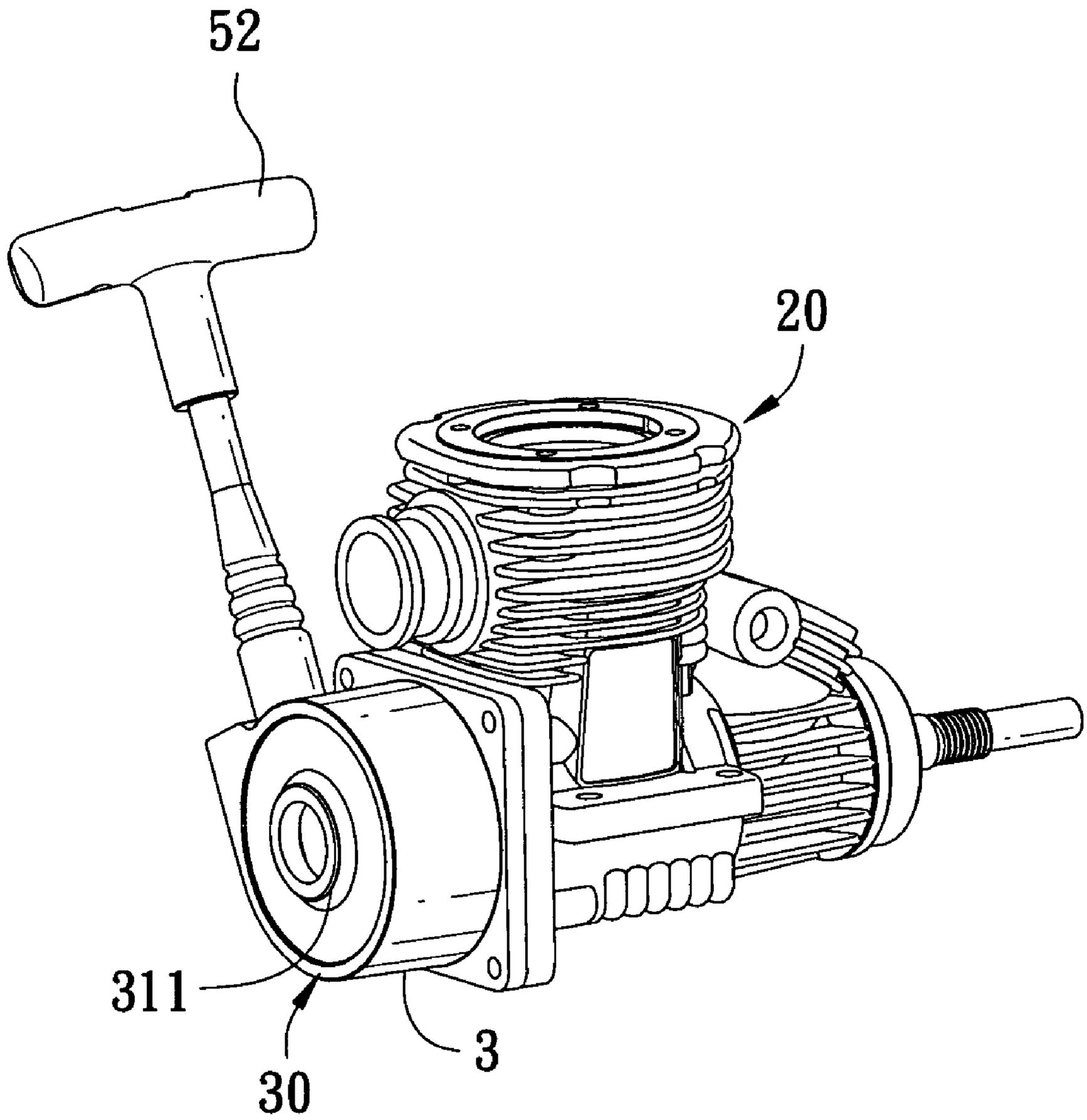


FIG. 3

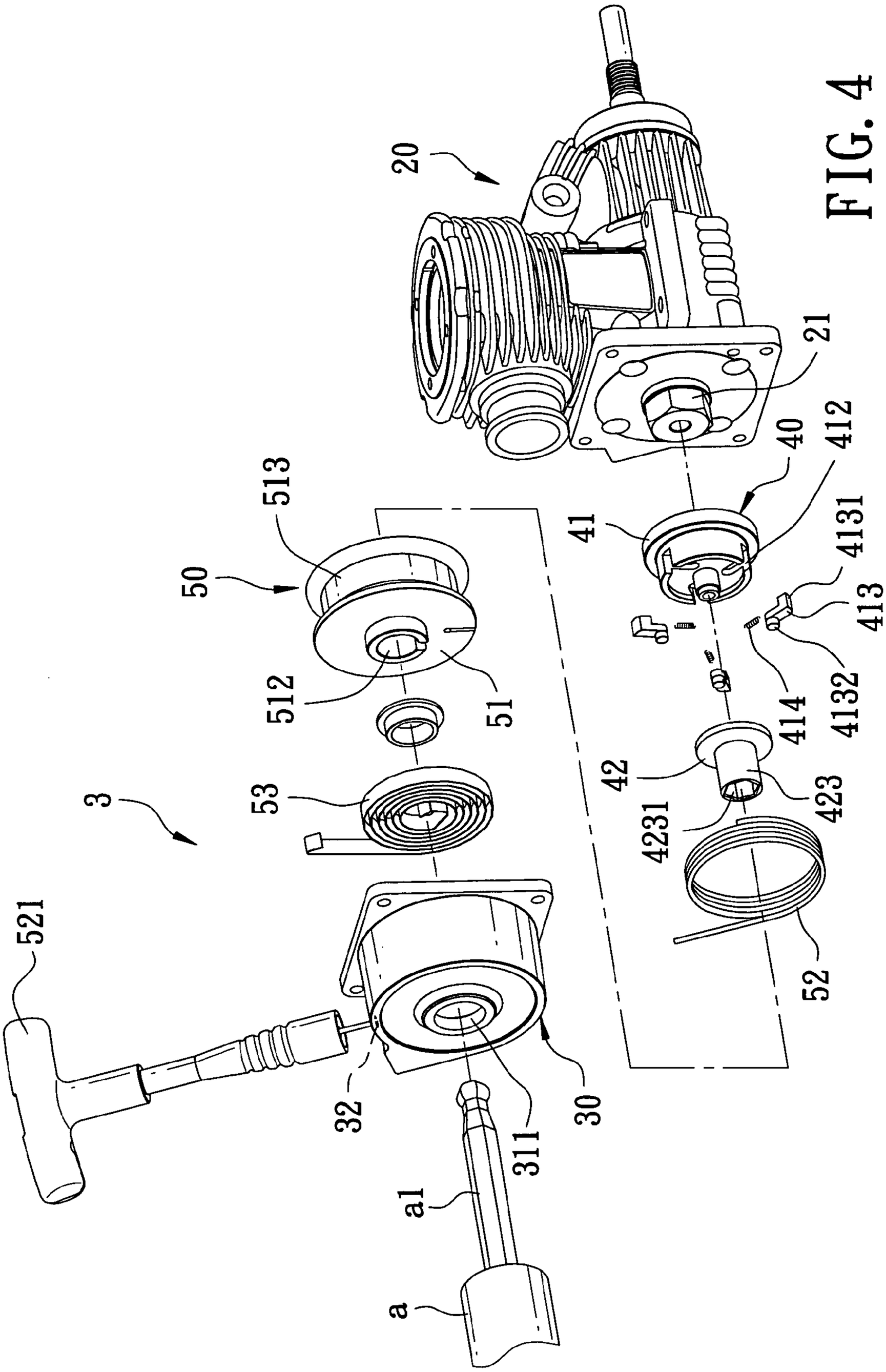

20
21
2
40
412
41
4131
413
414
4132
42
4231
423
52
3
521
50
513
512
51
53
32
311
30
a1
a

FIG. 4

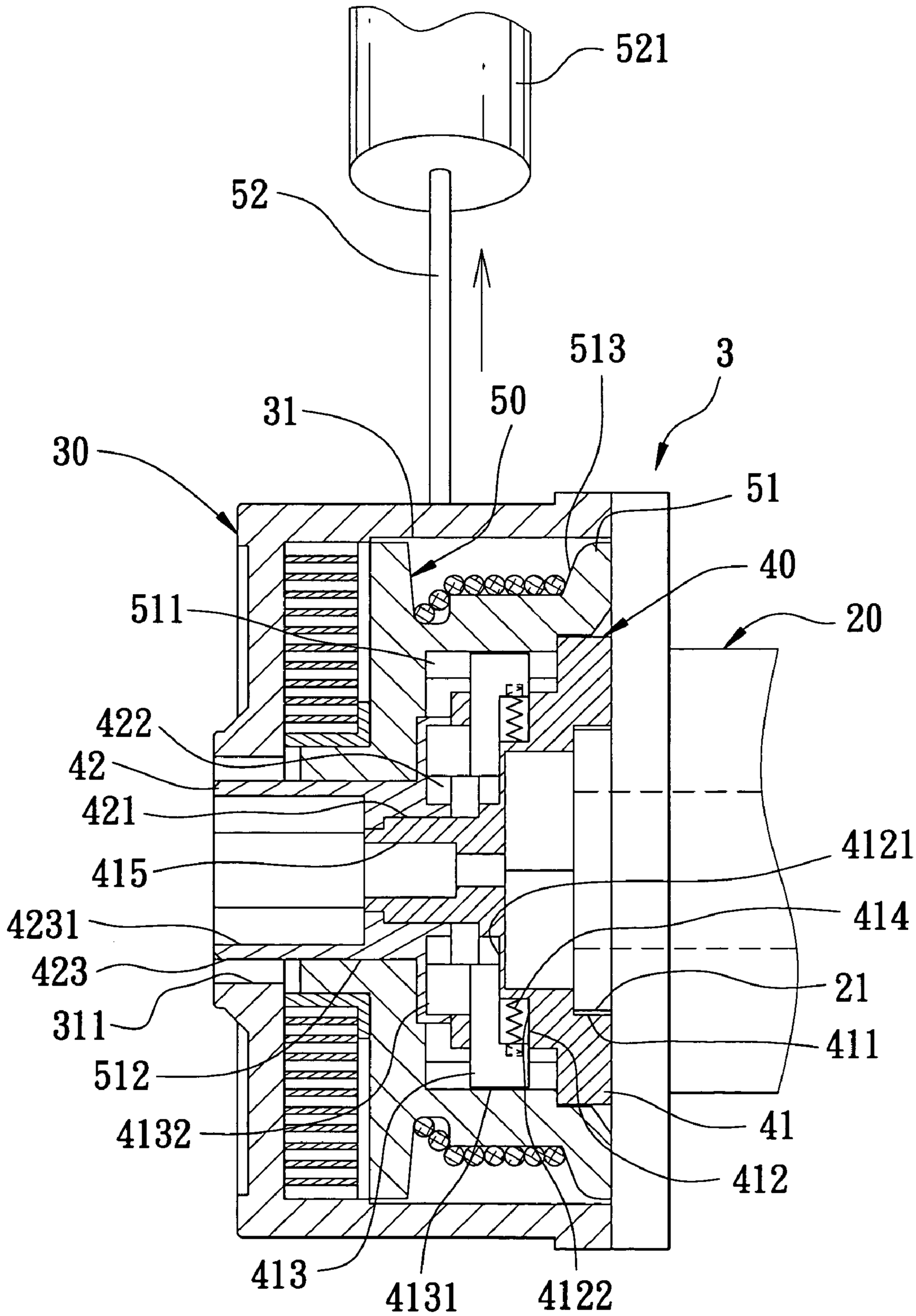

521
52
513
3
31
50
30
51
40
511
20
422
42
421
4121
415
414
4231
423
21
311
411
512
41
4132
412
413
4131
4122

FIG. 5

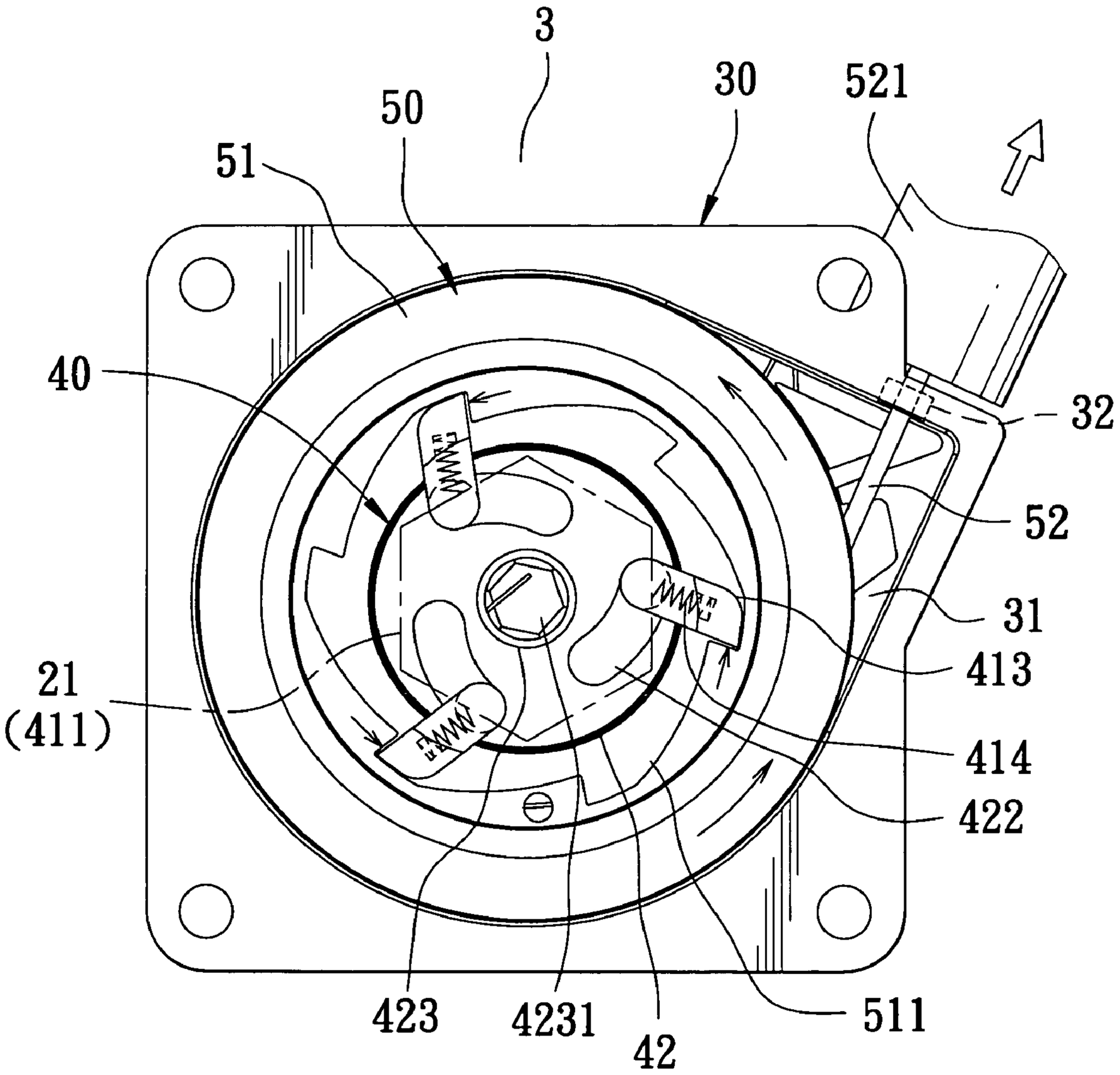


FIG. 6

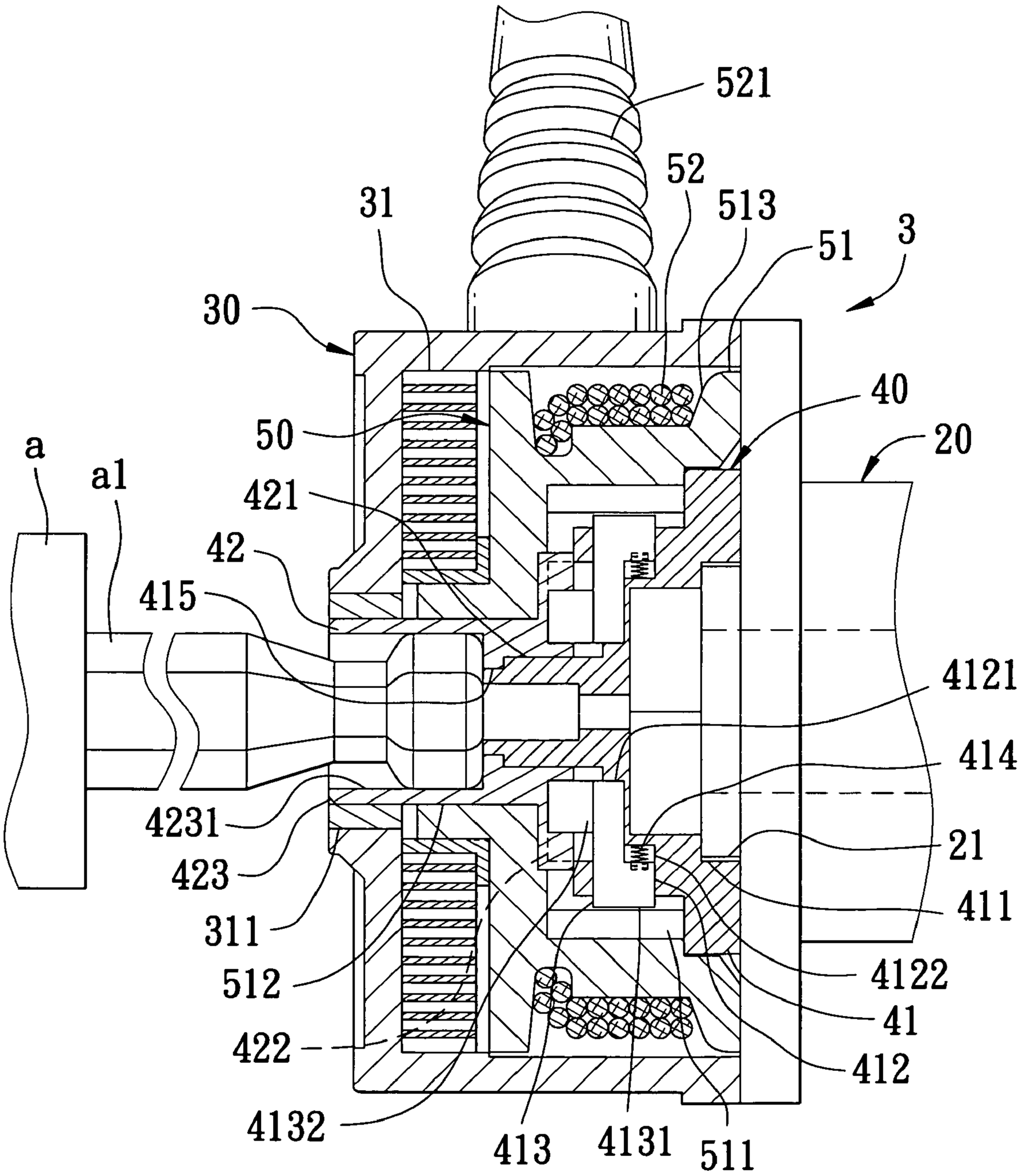

521
52
513
51
3
31
30
40
20
50
a
a1
421
42
415
4121
414
4231
423
21
311
411
512
4122
41
422
412
4132
413
4131
511

FIG. 7

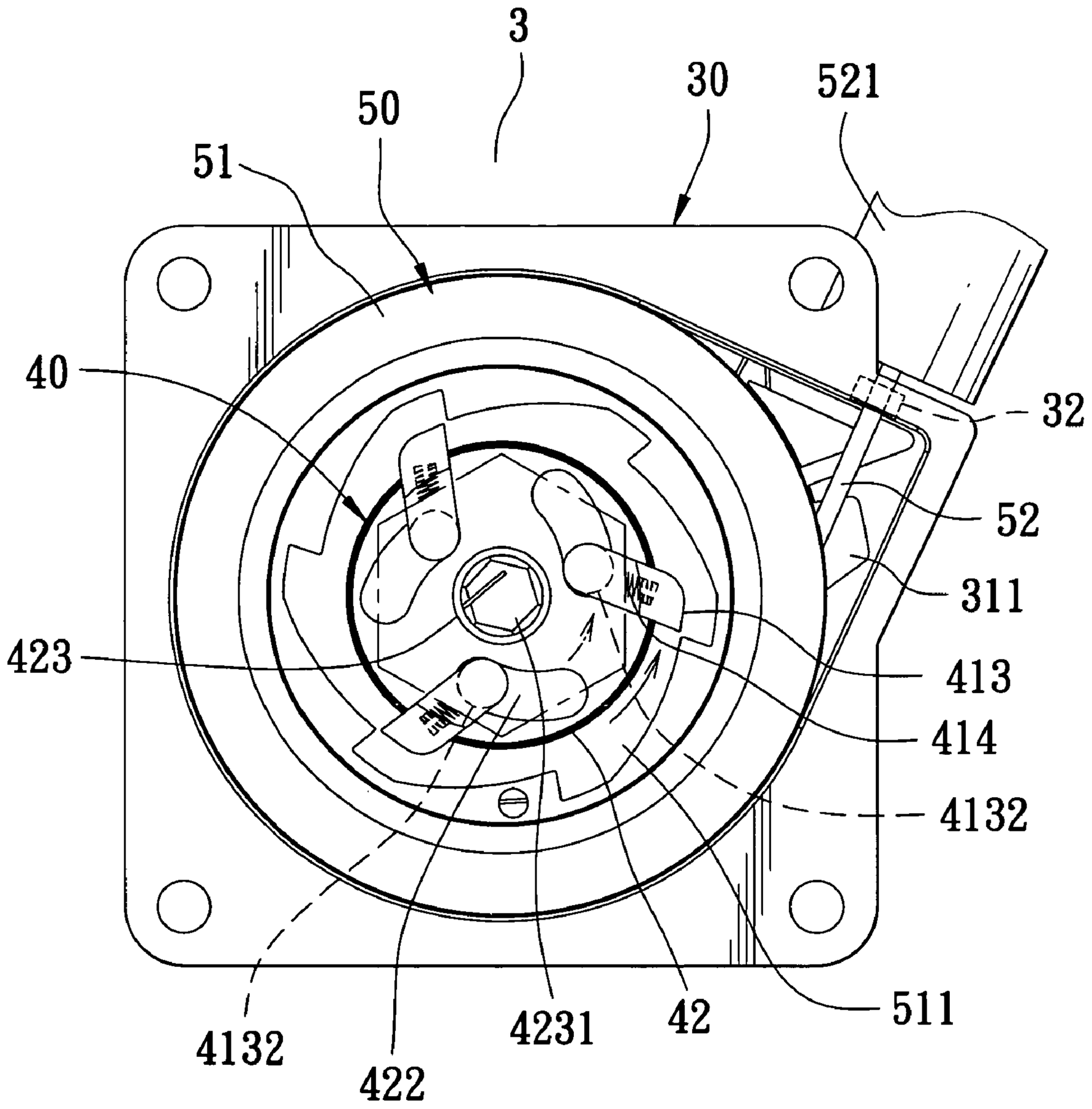


FIG. 8

STARTING DEVICE FOR A MODEL ENGINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a starting device for a model engine, particularly to one able to start the engine both manually and electrically.

2. Description of the Prior Art

Generally, a starting device for a conventional model engine is able to start the engine both manually and electrically. The starting device **10** of the conventional model engine, as shown in FIG. **1**, is mainly composed of a housing **11** and a transmission mechanism **12**. The transmission mechanism **12** received in the accommodating hollow **111** of the housing **11** is provided with a driving rod **121** inserted in the interior of the housing **11** to be connected with the crank of the engine and orderly fitted thereon with a first shaft coupler **122**, a driving member **123**, a winding wheel **124** and a second shaft coupler **125**. The first shaft coupler **122** has its center fitted axially with a first one-way bearing **1221**, the driving member **123** has its center fitted axially with a second one-way bearing **1231** and the winding wheel **124** has a pull rope **126** wound thereon. When the second shaft coupler **125** is actuated to operate by manually pulling the pull rope **126** or by electric operation, the second one-way bearing **1231** or the first one-way bearing **1221** will be driven to rotate and start the engine.

However, the starting device **10** of the conventional model engine has to install two one-way bearings in order to start the engine both manually or electrically, thus increasing cost in producing the starting device because the manufacturing cost of two one-way bearings is quite high.

SUMMARY OF THE INVENTION

The objective of this invention is to offer a starting device for a model engine, which includes an outer housing, an electric-operation unit and a rope-operation unit. The outer housing is firmly combined on a model engine and bored with an accommodating hollow for receiving the electric-operation unit and the rope-operation unit. The electric-operation unit consists of an engage wheel and a starting shaft. The engage wheel is firmly fitted on the outer side of the input rod of the engine and provided with engage teeth preset in number, which are respectively formed with a positioning shaft protruding outward. The starting shaft is slidably assembled on the engage wheel and has its inner side eccentrically bored with plural arc-shaped grooves for the positioning shafts of the engage wheel to slide and position therein. Further, the starting shaft has its outer end fitted with the rope wheel of the rope-operation unit, and the rope wheel has its inner side facing the starting shaft equidistantly and annularly bored with plural gradually-enlarged tooth grooves preset in multiple of the engage teeth of the engage wheel to be elastically engaged and restricted in position by the engage teeth of the engage wheel. When the model engine is started to rotate by the starting shaft of the electric-operation unit, the arc-shaped grooves of the starting shaft will actuate the engage teeth to shift toward the shaft center and disengage from the gradually enlarged tooth grooves. When the model engine is started by the rope-operation unit, the gradually-enlarged tooth grooves of the rope wheel will be engaged and restricted in position by the engage teeth of the engage wheel and simultaneously the engage teeth will drive the starting shaft to rotate. The starting device for a model engine of this invention is simple in structure and able to reduce producing cost.

BRIEF DESCRIPTION OF DRAWINGS

This invention will be better understood by referring to the accompanying drawings, wherein:

FIG. **1** is a perspective view of a starting device for a conventional model engine;

FIG. **2** is a cross-sectional view of the starting device for a conventional model engine;

FIG. **3** is a perspective view of a starting device for a model engine in the present invention;

FIG. **4** is an exploded perspective view of the starting device for a model engine in the present invention;

FIG. **5** is a cross-sectional view of the starting device starting the engine under manually started condition in the present invention;

FIG. **6** is a side cross-sectional view of the starting device starting the engine under manually started condition in the present invention;

FIG. **7** is a cross-sectional view of the starting device starting the engine under electrically started condition in the present invention; and

FIG. **8** is a side cross-sectional view of the starting device starting the engine under electrically started condition in the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of a starting device for a model engine in the present invention, as shown in FIGS. **3** and **4**, includes a model engine **20**, a starting device **3**, an electric-operation unit **40** and rope-operation unit **50** as main components combined together.

The model engine **20** has its outer side fixed with a hexagonal input rod **21** extending outward horizontally.

The starting device **3** is firmly fitted on the input rod **21** of the model engine **20**, able to drive the input rod **21** to rotate. The starting device **3**, referring to FIGS. **5** and **6**, is formed with an outer housing **30** to be mounted on the outer side of the engine **20**. The housing **30** has its inner side formed with an accommodating hollow **31** receiving therein the electric-operation unit **40** and the rope-operation unit **50**. The accommodating hollow **31** has its center bored with an outward hole **311**, and the housing **30** has one side wall bored with a rope hole **32**.

The electric-operation unit **40** is mainly composed of an engage wheel **41** and a starting shaft **42**. The engage wheel **41** is made of a disk, having its inner side bored with a hexagonal combining groove **411** to be firmly fitted on the outer side of the input rod **21** of the engine **20** and its outer side axially and eccentrically bored with engage notches **412** preset in number, which are respectively composed of an engage tooth groove **4121** and a spring groove **4122**. Each engage notch **412** has its interior receiving an engage tooth **413** and an elastic member **414**, and the engage tooth **413** is elastically engaged in the engage tooth groove **4121** and the elastic member **414** (a compression spring) electrically positioned in the spring groove **4122**. Each engage tooth **413** has its upper end formed with a protruding elastic end **4131** for restrictingly positioning the elastic member **414** in the spring groove **4122** and has its lower outer side disposed with a positioning shaft **4132** extending outward. Further, the engage wheel **41** is fixed with a fitting rod **415** extending outward from the center. The starting shaft **42** has its inner

end bored with a fitting slot **421** to be slidably fitted around the fitting rod **415** of the engage wheel **41**. The fitting slot **421** of the starting shaft **42** has its circumference eccentrically bored with plural arc-shaped grooves **422** for respectively receiving the engage teeth **413** of the engage wheel **41**, with the positioning shaft **4132** of the engage tooth **413** slidably positioned in the arc-shaped groove **422**. Thus, when the arc-shaped grooves **422** are rotated, the positioning shafts **4132** will be driven to rotate and actuate the engage teeth **413** to move back and forth axially in the engage notches **412**. Furthermore, the starting shaft **42** has the opposite side of the fitting slot **421** provided with a coupling rod **423** extending outward axially and having its center bored with a hexagonal starting slot **4231**.

The rope-operation unit **50** includes a rope wheel **51**, a pull rope **52** and a restoring elastic member **53**. The rope wheel **51** has its center equidistantly and annularly bored with six gradually enlarged tooth grooves **511**. The rope wheel **51** is further bored with an insert hole **512** in the center of the six gradually-enlarged tooth grooves **511**, having its outer circumference formed with an annular rope recess **513**. The coupling rod **423** of the starting shaft **42** is inserted through the insert hole **512** of the rope wheel **51** and pivotally fitted in the outward hole **311** of the housing **30**. The engage wheel **41** is received in the gradually enlarged tooth grooves **511**, having its engage teeth **413** respectively and elastically engaged in the gradually enlarged tooth grooves **511**. The pull rope **52** is wound in the rope recess **513** of the rope wheel **51** to be drawn for actuating the rope wheel **51** to rotate, having one end secured on the rope pulley **51** and the other end inserted out of the rope hole **32** of the housing **30** and connected with a pull handle **521**. The restoring elastic member **53** has one end secured on the rope wheel **51** and the other end fixed in the accommodating hollow **31** of the housing **30**. Thus, when the pull rope **52** is drawn to turn the rope wheel **51**, the restoring elastic member **53** will be compressed to produce a resilience restoring force.

In using, as shown in FIGS. **5** and **6**, when the model engine **20** needs to be started by manually drawing the pull rope **52**, the pull rope **52** is first drawn to actuate the rope wheel **51** to rotate, and simultaneously the engage teeth **413** of the engage wheel **41** will be forced by the elastic member **414** to be respectively engaged in the gradually-enlarged tooth grooves **511**. When actuated to rotate, the rope wheel **51** will actuate the engage wheel **41** together with the input rod **21** of the engine **20** to rotate. When the pull rope **52** is drawn, the restoring elastic member **53** will be compressed to produce a resilience restoring force, and when the drawing force of the pull rope **52** vanishes, the rope pulley **51** will be forced by the restoring elastic member **53** to rotate reversely and the pull rope **52** will be rewound around the rope recess **513** of the rope wheel **51**.

Referring to FIGS. **7** and **8**, when the model engine **20** needs to be started by an electric motor (a), the coupling rod (a**1**) of the electric motor (a) is inserted in the starting groove **4231** of the starting shaft **42** to drive the starting shaft **42** to rotate. At this time, the arc-shaped grooves **422** of the starting shaft **42** will actuate the positioning shafts **4132** of the engage tooth **413** to move nearer to the center end, and simultaneously the engage teeth **413** will axially be moved toward the shaft center, and the elastic ends **4131** will be actuated to compress the elastic members **414**, letting the engage teeth **413** disengaged from the gradually-enlarged tooth grooves **511**. Thus, when started by the electric motor (a), the starting shaft **42** will directly drive the engage wheel **41** and the input rod **21** of the engine **20** to rotate synchronously. When the electric motor (a) is removed from the starting shaft **42**, the elastic members **414** will produce a resilience restoring force to push the engage teeth **413** outward, and meanwhile the positioning shafts **4132** will be moved to the outer circumferential end of the arc-shaped groove **422** and the engage teeth **413** will be elastically engaged in the gradually-enlarged tooth grooves **511**.

As can be understood from the above description, this invention has the following advantages.

1. The starting device for a model engine in the present invention is provided with the electric-operation unit and the rope-operation unit for starting the engine with different modes by changing the position of the engage teeth in the arc-shaped grooves, simple in structure, lowering the frequency of maintenance, and able to reduce producing cost and enhance market competitive force.

2. The starting device is composed of only a few components, and the electric-operation unit is received in the rope wheel, thus reducing the weight and the size of the starting device and the model car, and enhancing speeds and facilitating control of the model car.

3. The starting device is received in the interior of the housing, so the inner components of the starting device can be protected from being damaged, able to prolong the service life of the starting device.

While the preferred embodiment of the invention has been described above, it will be recognized and understood that various modifications may be made therein and the appended claims are intended to cover all such modifications that may fall within the spirit and scope of the invention.

I claim:

1. A starting device for a model engine comprising an input rod extending outward at one outer side of a model engine, said starting device firmly fitted on said input rod for actuating said input rod and said model engine to rotate; and characterized by:

Said starting device composed of a housing, an electric-operation unit and a rope operation unit;

Said housing secured on said model engine, said housing formed with an accommodating hollow for receiving said electric-operation unit and said rope operation unit, said accommodating hollow bored with an outward hole in the center;

Said electric-operation unit composed of an engage wheel and a starting shaft, said engage wheel made of a disk firmly fitted on the outer side of said input rod of said model engine, said engage wheel having its outer side axially and eccentrically cut with engage notches preset in number, said engage notches respectively receiving therein an engage tooth and an elastic member, said engage tooth having its lower outer side formed with a positioning shaft protruding outward, said engage wheel having the center of its outer side fixed with a fitting rod extending outward, said starting shaft having its inner side formed with a fitting slot to be fitted on said fitting rod of said engage wheel, said fitting slot having its circumference eccentrically bored with plural arc-shaped grooves corresponding with said engage teeth of said engage wheel, said positioning shafts of said engage teeth respectively and slidably received in said arc-shaped grooves of said starting shaft, said arc shaped grooves rotated to actuate said positioning shafts to turn and force the engage teeth to move back and forth axially in said engage notches, said starting shaft having its outer side disposed with a coupling rod extending outward axially, said coupling rod bored with a starting groove in the center; and,

said rope-operation unit composed of a rope wheel, a pull rope and a restoring elastic member, said rope wheel fitted around said coupling rod of said starting shaft, said rope wheel having its inner side facing said coupling rod of said starting shaft equidistantly and annularly bored with plural tooth grooves of a multiple number of said engage teeth of said engage wheel, said tooth grooves of said rope wheel engaged and restricted in position by said engage teeth of said engage wheel, said pull rope wound around said rope wheel to be drawn for turning said rope wheel, said restoring elastic member combined with said rope pulley, said restoring elastic member able to produce a resilience restoring force when said pull rope is drawn.

2. The starting device for a model engine as claimed in claim **1**, wherein said engage notch of said engage wheel is composed of an engage tooth groove and a spring groove, said engage tooth positioned in said engage tooth groove and having its upper end formed with an elastic end protruding toward one side of said engage notch, said elastic member elastically positioned between said spring groove and said elastic end.

3. The starting device for a model engine a claimed in claim **1** or **2**, wherein said elastic member is a compression spring.

4. The starting device for a model engine as claimed in claim **1**, wherein said input rod has its front end formed with a hexagonal member, and said engage wheel has its inner side bored with a hexagonal combining groove for said input rod to be fitted therein tightly.

5. The starting device for a model engine as claimed in claim **1**, wherein said rope wheel is equidistantly and annularly formed with plural gradually-enlarged tooth grooves in the center and bored with an insert hole in the center of said gradually-enlarged tooth grooves, said coupling rod of said starting shaft inserted through said insert hole of said rope wheel, said engage wheel received in said gradually-enlarged tooth grooves, said engage teeth of said engage wheel respectively and elastically engaged in said gradually-enlarged tooth grooves.

* * * * *